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the contents of a work which he will find replete with interest, and bearing on every page the marks of wide reading and conscientious reflection.

JOHN WATSON.

A History of European Thought in the Nineteenth Century. By JOHN THEODORE MERZ. Vol. I, Introduction to Scientific Thought, Part I. Edinburgh and London, William Blackwood & Sons, 1896. — pp. xiv, 458.

This is the first instalment of an extensive work in which the author proposes to treat of the scientific, philosophical, and religious thought of this century. The present volume contains the general introduction to the whole work (pp. 1–85), and the first half of the history of scientific thinking. This part of the history will be completed in the second volume.

"The object of the work," the author tells us in his preface, "is philosophical in the sense now accepted by many and divergent schools — *i.e.*, it desires to contribute something towards a unification of thought." "The possession of a map showing the many lines of thought which our age has cultivated seemed to me the first requisite, the basis from which a more complete unification would have to start." Mr. Merz refuses to attempt to define 'thought', feeling that any definition would involve inevitable controversies which would be embarrassing and confusing. "In general it will be enough to notice that thought does not mean merely defined, clear, methodical thought, but likewise the great region of desire, impulse, feeling, and imagination, all of which play, we must admit, a great part in the inner life of the soul as well as in that of the outer world" (p. 5). Although the author wisely abstains from encumbering his work with any logical or metaphysical discussions, he never loses sight of the fact that the various events which he has to describe are the products of thought, and derive their interest and significance from their organic connection with the growth of intelligence. "Of every change in nature or human life we can ask: What has been its result in the world of thought? What gain or loss, what progress, has it worked in the minds of men, of us the beholders? . . . And of every change in human affairs we can ask this further question: What part has thought, the inner life, played in this change? These two questions mark the task of the historian of thought" (p. 4).

Mr. Merz has recognized that it is impossible for any one man to gain a first-hand acquaintance with all that thought has done during this century in the various countries of the civilized world, and to justly estimate the significance of its achievements in every case. He has, therefore, limited his subject to a history of the thought of France, Germany, and England, during the greater part of the nineteenth century. This limitation still leaves a subject of vast dimensions, the central portion of European thought.

At the beginning of the century, or even fifty years ago, one could not speak of European thought in the sense in which we use that term to-day. Science, down to the middle of the present century, had a national rather than an international character. For this reason, Mr. Merz has found it necessary to treat in separate chapters of the early developments of the scientific spirit in the three countries with which he is concerned. The various intellectual influences which were at work in France, Germany, and England, are very clearly traced in these chapters, which furnish as well a very valuable contribution to the history of scientific discoveries and scientific methods. The following quotations are taken from the author's comparison of the work of the three nations: "France was the country in which the modern scientific methods of measurements, calculation, and classification, were first practised on a large scale, reduced to a system, and employed for the investigation of the whole of nature. The Academy of the Sciences, together with the High Schools of Science, the Natural History collections, and Medical Institutions, all in close connection, furnished an organization of the highest intelligences of the nation, by which a systematic exploration of the heavens and the earth . . . could be undertaken. . . . It was in France also that the discoveries of the laboratory were first applied so as to contribute to the revolution of the arts and industries. . . . What might at times have been wanting in French science, historical completeness and philosophical criticism, was added in Germany. Germany has, in the course of this century, not only become the country where the most faithful and exhaustive record is kept of the scientific labors of the whole world, but it has also become the country where mainly those problems have been attacked which lie on the borderland of natural science and philosophy, the problems of life and consciousness. Modern physiology, especially psycho-physics, is claimed as essentially a German science. In England, individual, as opposed to corporate effort, has been rewarded by a succession of brilliant discoveries. . . . For the want of organizations of research and teaching, such as other countries possessed, these ideas of English thinkers have frequently lain dormant or been elaborated by foreign talent. . . . The largest number of works, perfect in form and substance, classical for all time, belongs probably to France; the greatest bulk of scientific work probably to Germany; but of the new ideas which during this century have fructified science, the larger share probably belongs to England" (pp. 298–301).

In the two remaining chapters of the volume, Mr. Merz discusses respectively the astronomical and the atomic view of nature. By the former is meant that view of the world which rests upon, and seeks everywhere to apply, the formula of gravitation propounded by Newton; and by the latter the theory which forms the foundation of chemistry and which is usually associated with the name of Dalton. Both of these views, as well as many other ideas which mark the progress of scientific thought in this century, were familiar to the philosophers of Greece and Rome. But in the minds of the ancient thinkers these ideas were merely vague and obscure notions, unverifiable hypotheses of which no real use could be made. Hence they lay dormant for centuries. "In every case the awakening touch has been the mathematical spirit, the attempt to count, to measure, and to calculate. . . . It is the geometrical figure, the dry algebraical formula, which transforms the vague reasoning of the philosopher into a tangible and manageable conception" (p. 314). It is only when thus supplemented that an hypothesis is capable of being employed as a principle of real explanation in science. It is verification which constitutes an hypothesis scientific, and *exact* verification is only obtainable through the application of mathematical calculation and deduction. "Descartes, and after him Malebranche, filled space with vortices which were to explain the constitution of matter, and the movements of its parts; but the notion was abandoned and ridiculed till Helmholtz and Thomson approached the subject with mathematical analysis and calculated the properties of vortex motion" (p. 313).

Mr. Merz's work is written, as has already been stated, from a philosophical point of view; and this volume can scarcely fail to prove of service to any one interested in the development of thought. The very copious footnotes appended to almost every page are at first rather distracting, but they may perhaps be neglected on a first reading of the volume. In themselves, these notes contain a vast amount of information and important references for further study. They also show how painstaking has been the author's investigation, and upon what a solid basis of fact his conclusions rest. The style of the book is clear, interesting, and in some passages eloquent and fascinating. It is because of these qualities that I have advised reading continuously through the text, and returning later to a study of the notes.

The remaining volumes of Mr. Merz's work will be awaited with much interest. If we may judge from the volume before us, we should say that when completed the work will occupy the place at the end of the century which Whewell's *History of the Inductive Sciences*, and *Philosophy of the Inductive Sciences* have held for the last fifty years. For, like Whewell, Mr. Merz is convinced that the best method of becoming acquainted with the nature of knowledge is by an examination of the structure and methods of the sciences. And it must be remembered that there is to-day a much greater amount of data upon which to build a doctrine of knowledge than at the time when Whewell wrote his history. During the last forty years, thought has accomplished more in the field of the inductive sciences than at any previous time in the history of the race. And it is only reasonable to suppose that by an examination of these new achievements, these new thought-products, there is much to be learned regarding the nature and structure of intelligence itself. It is not the business of philosophy to create truth by any *a priori* process, but to bring to consciousness the principles which thought employs in solving the problems which the world presents to it. As Hegel has said, it is not until the shades of evening fall that the bird of Minerva begins its flight.

J. E. CREIGHTON.